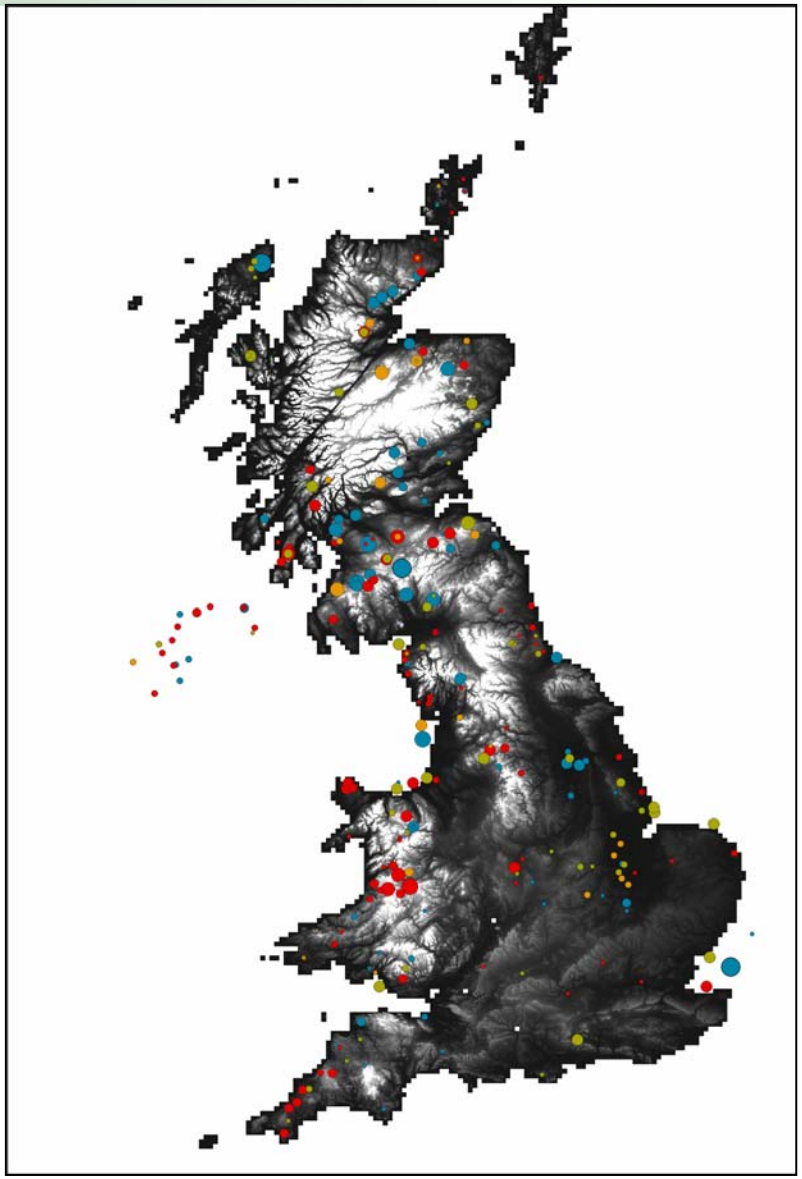
Ornithological assessment for wind farms: Lessons learned in the United Kingdom

RICHARD WALLS
Central Science Laboratory (CSL)
Department for Environment, Food & Rural Affairs (DEFRA)
United Kingdom, Sand Hutton, York, YO41 1LZ.
r.walls@csl.gov.uk

Wind Development in the UK.

Operational wind farms		Wind Farms	MW Capacity
Onshore	England	51	246.92
	Northern Ireland	12	106.6
	Scotland	36	858.04
	Wales	24	269.2
Offshore	England	3	153.8
	Wales	1	60
Wind farms currently under construction			
Onshore	England	7	79.5
	Northern Ireland	1	24.5
	Scotland	11	253
	Wales	2	32.25
Offshore	England	1	90
Consented projects			
Onshore	England	35	537.7
	Northern Ireland	6	51.3
	Scotland	29	1,081.85
	Wales	4	26.6
Offshore	England	5	486
	Scotland	2	180
	Wales	2	189
Projects in planning			
Onshore	England	50	891.28
	Northern Ireland	26	579.25
	Scotland	73	4,985.10
	Wales	16	203.48
Offshore	England	10	4,283.00

	Wind Farms	MW Capacity
Total	**407**	**15668.37**
Operational	**127**	**1694.56**
Under Construction	**22**	**479.25**
Consented	**83**	**2552.45**
In Planning Process	**175**	**10942.11**



Leading the process in the UK.

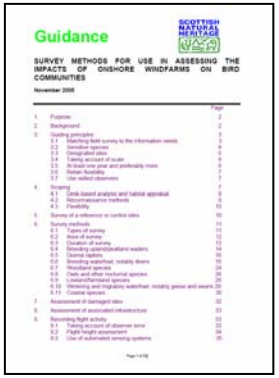
1. Statutory Nature Conservation bodies & DEFRA lead the process in UK.
   (SNH – Scottish Natural Heritage, EN- English Nature, CCW – Wales).

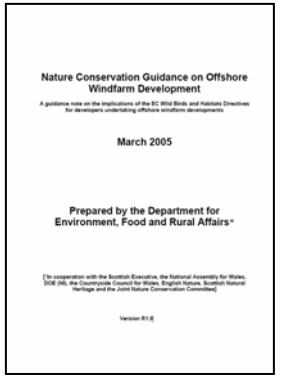
2. Considerable role of Non-Governmental Organisations
   (RSPB – Royal Society for the Protection for Birds)

3. Wind Industry involvement through:
   BWEA (British Wind Energy Association)
   SRF (Scottish Renewables Forum) &
   COWRIE – (Collaborative Offshore Wind Research into the Environment)

Guidance documents

1. ***SNH -*** ***"Survey methods for use in assessing the impacts of onshore windfarms on bird communities "*** **(**latest Version, November, 2005**).**
2. **SNH - "Windfarms and birds: Calculating a theoretical collision risk assuming no avoiding action" (Band model & guidance)**
3. **DEFRA – "*Nature Conservation Guidance on Offshore Windfarm Development A guidance note on the implications of the EC Wild Birds and Habitats Directives for developers undertaking offshore windfarm developments*". (**March, 2005**).**
4. **COWRIE – *"Towards standardised seabirds at sea census techniques in connection with environmental Impact assessments for offshore wind farms in the U.K: A comparison of ship and aerial sampling methods for marine birds, and their applicability to offshore wind farm assessments"*** **(**Camphuysen et al, 2004**).**
5. **COWRIE – "*Best practice guidance for the use of remote techniques for observing bird behaviour in relation to offshore wind farms* ". (**Desholm, M., Fox, A.D. & Beasley, P.D, 2005**).**
6. **SNH - SIGNIFICANCE/THREHOLDS GUIDANCE for bird population ecology for species defined by bio-geographic regions. (**summer, 2006**).**





Assessment of wind turbine impacts

- Pre-construction studies (In the UK 2-3yrs on average, up to 5 yrs)
  Scoping studies and EIA (Ornithological Chapter for EIA)
- Construction studies (inconsistency in individual cases)
- Post-construction studies (inconsistency in individual cases)

- Collision Mortality
- Disturbance
- Displacement (Habitat loss)
- Barrier effect
- Cumulative effects

Determining the SIGNIFICANCE of impacts?

1. IS THE **LOCATION SIGNIFICANT**?
2. WHICH **SPECIES ARE PRESENT**?
3. WHICH **SPECIES ARE SIGNIFICANT**?
4. ARE **SIGNIFICANT IMPACTS LIKELY**?
5. ARE THEIR **ALTERNATIVE SITES**?
6. **LEGISLATIVE & CONSERVATION STATUS ARE KEY.**

- **Location is key?**
- **Similar process On & Offshore.**
- **No existing bird data for a site does not equate to no concerns.**

(DEFRA, Offshore guidance 2005**)**

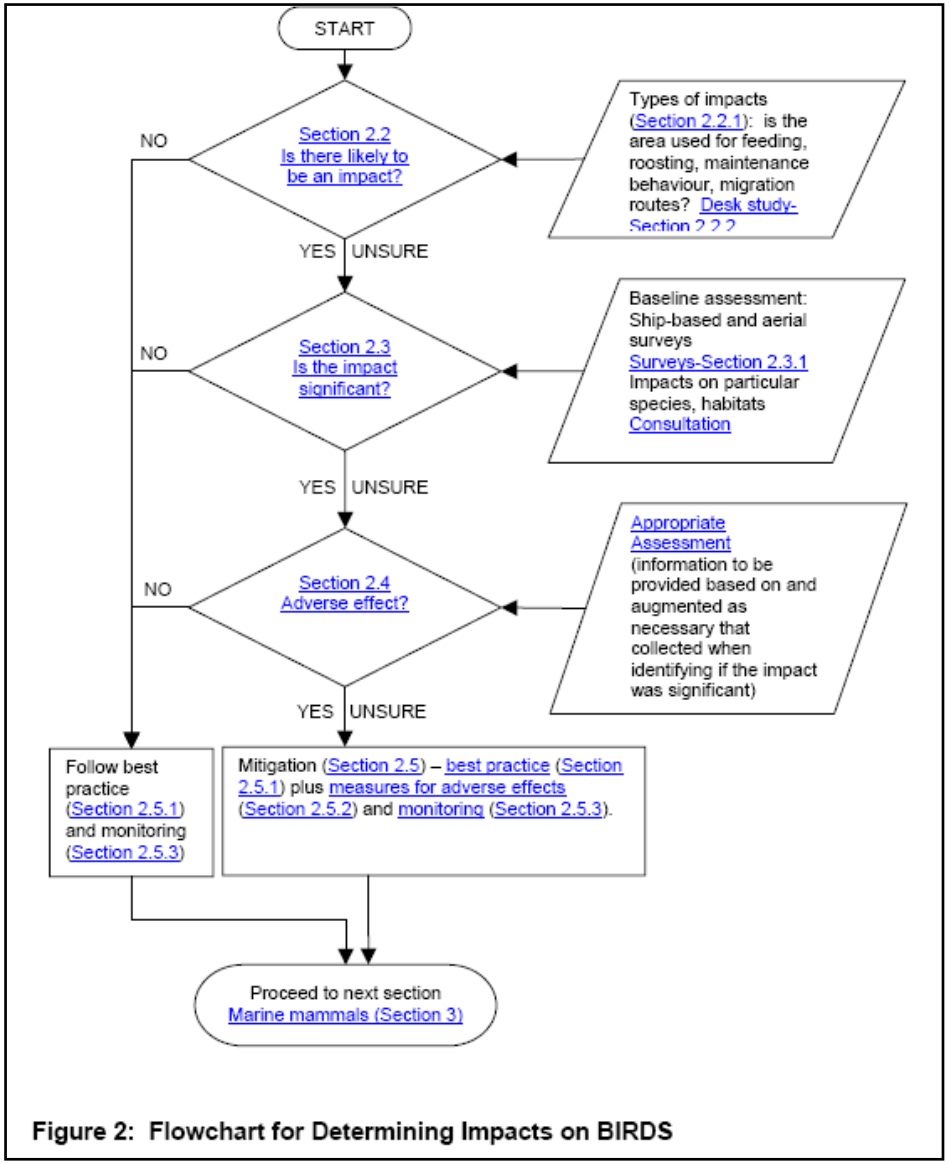


Figure 2: Flowchart for Determining Impacts on BIRDS

EIA AND THE PRECAUTIONARY PRINCIPLE

1. **Monitoring duration?**
   What is required for EIA.

2. **Minimum requirements of Monitoring?**
   - **Minimum of 2-3yrs.**
   - **Minimum of 36hrs per Vantage Point per Season to cover the wind farm footprint + buffer.**

3. **Biological variation.**
   Biological data IS UNCERTAIN

4. **Who decides if it has been done appropriately?**
   The COMPETENT AUTHORITY.

5. **NEED TO BALANCE ENERGY POLICY WITH CONSERVATION INTERESTS.**

8. **Developer is responsible to undertake an appropriate EIA assessment.**

THE TIMES SATURDAY JANUARY 28 2006 15C

Wind farms condemned as eagles fall prey to turbines

The drive for clean energy is bad news for one of Britain's rarest birds, writes Valerie Elliott

WIND turbines have caused the deaths of four white-tailed eagles on isolated islands off the Norwegian coast.

As many as 30 other eagles have failed to return to their nesting sites within the wind farm area on Smola, six miles northwest of Norway, according to wildlife campaigners.

The dead birds were found between August and December last year. Two had been sliced in half, apparently by a turbine blade. Post-mortem examinations, however, attributed the birds' deaths to multiple trauma caused by a heavy blow.

The Royal Society for the Protection of Birds (RSPB) is concerned that wind farms in Britain could exact a similar toll on native and migrating wild birds, especially as the white-tailed eagle, the largest eagle species in Europe, is beginning to thrive at last in the Western Isles of Scotland after a 30-year reintroduction project.

This area has also been earmarked by developers as prime land for the construction of wind farms. Campaigners are already lobbying against a proposed 234-turbine project on peatlands on north Lewis because of the threat it poses to eagles.

The effect of the wind turbines on white-tailed eagles has been revealed after research by the RSPB in collaboration with the Norwegian Institute for Nature Research (known as NINA) and the Norwegian Sea Eagle Project. Work concentrated on Smola because it is listed by Bird Life International as an important area and because it has one of the highest breeding figures for

WHITE-TAILED EAGLE

- Breeds in Northern Europe and Asia. Biggest population is along the coast of Norway
- It was hunted to extinction in Britain in the early 19th century, but there are 33 pairs on Mull, Lewis and Skye, which were introduced 30 years ago
- It likes to live on rocky coastlines but will also live near rivers and large lakes and feeds on fish, smaller birds and rodents
- Males weigh up to 5kg (11lbs) and females up to 7kg. They are up to a metre long and have a wingspan of up to 2.4m

UK Monitoring Techniques

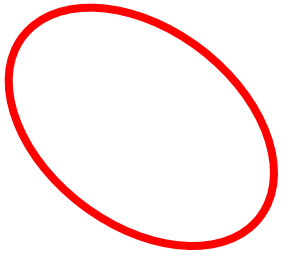
ONSHORE WIND DEVELOPMENTS

- **Vantage Point Surveys (**Winter, Migration & Breeding**)**
- **Species-specific Bird Monitoring Methods (**Gilbert *et al*, 1999**)**
- **Walk Over Surveys.**
- **Breeding Bird Surveys.**
- **Radio-tracking studies.**
- **Short range - Bird Detection Radar**
- **Long range – Weather Radar (**Met Office & CSL**)**
- **Thermal Imagery & Night Vision equipment.**

OFFSHORE WIND DEVELOPMENTS

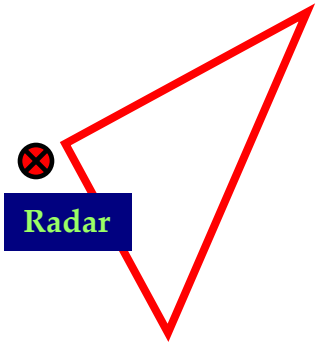
- **Vantage Point Surveys (**Seawatching Inshore <3km**)**
- **Boat-based surveys**
- **Aerial Surveys (**Collective funding by wind industry**)**
- **Short range - Bird Detection Radar**
- **Jack-up barge platforms.**
- **Radio-tracking & Satelite telemetry.**

Case study: Greenland White-fronted geese.



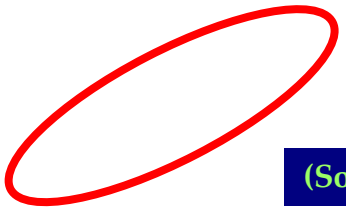
SPA (Feeding grounds)

(Northern Roost Loch)



Radar

White circles
= Survey Vantage Points



(Southern Roost Loch)

Case study: Greenland White-fronted geese

- **Bird Detection Radar supported previous visual observations (**Majority of goose flights transit the south of the site**).**

- **Goose movements recorded by radar during very low visibility appeared disorientated (<250m).**

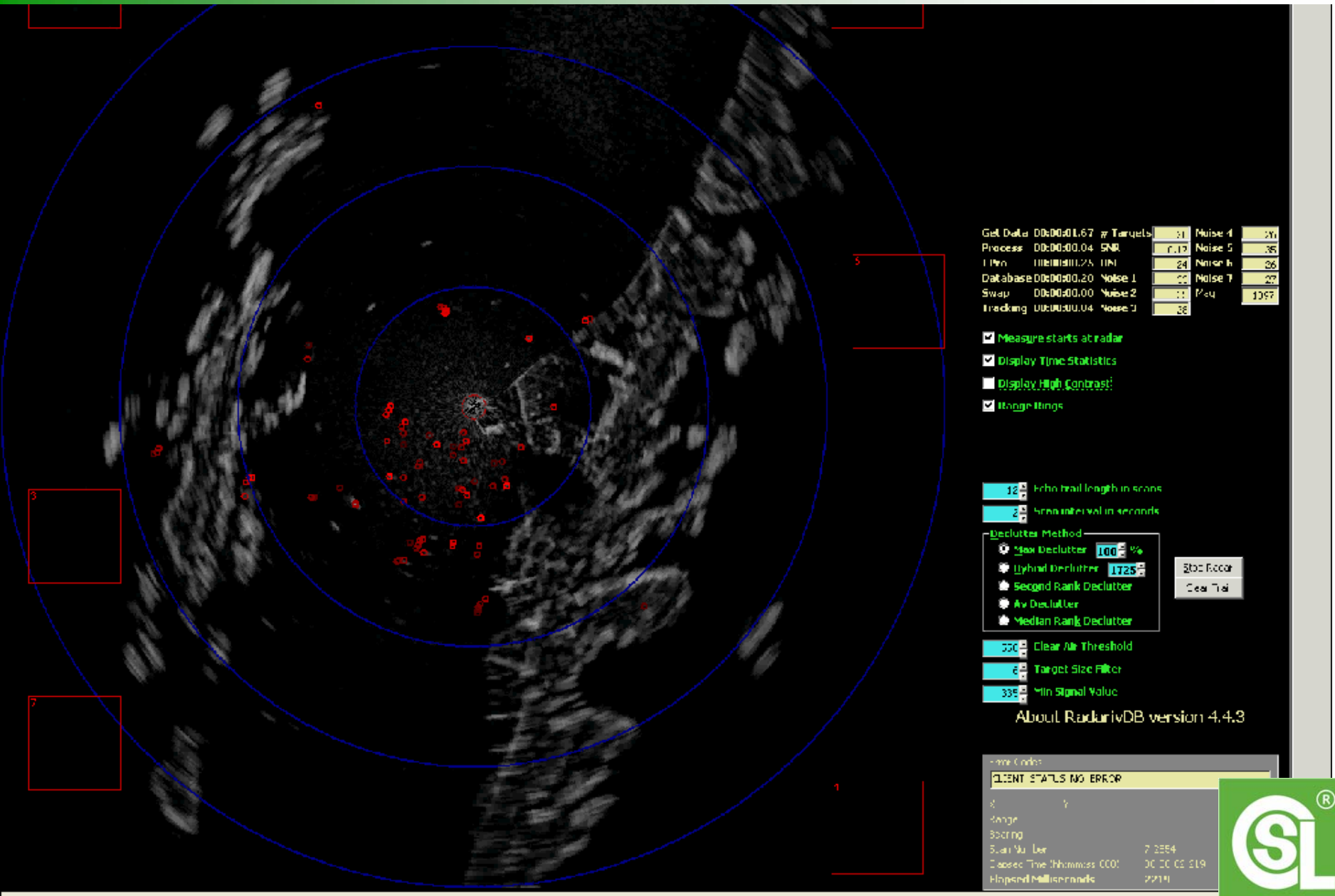
- **Proportions of goose flight activity 24hrs:**
  - **Dawn 06:00-09:00hrs (43%)**
  - **Day 09:00-15:00hrs (9%)**
  - **Dusk 15:00-18:00hrs (20%)**
  - **Night 18:00-06:00hrs (28%)**

- **Flights observed within the proposed wind farm by Bird Detection Radar (3.72%) and visual observations (3.6%) were similar.**

- **Landscape contours were used during commuting flights.**

Case study: Greenland White-fronted geese.

Disorientated behaviour during low visibility.



Mull of Kintyre2 S-Band Rhun Pt 02-03.12.2004_002.avi

Case study: Golden eagle (natural research Ltd)

- Resident Golden Eagles Argyll, western Scotland.
- **776hrs of observations** before & after 1997-2004.
- Overall eagle **range size was similar before & after**.
- Eagles **appeared to change ranging to avoid WF site**.
- WF was over flown mostly to deal with intrusions into territory.
- **Forestry was felled to mitigate the loss of foraging habitat** due to WF.
- This aimed to draw eagles away from the WF reducing collision risk.
- **Eagles were seen in the tree cleared area 3 times more after felling than before**.
- Ranging shifted away from the windfarm in the direction of the felled area.
- Findings are from a single pair and should be used cautiously.
- Important first step in understanding the likely effects of windfarms on UK eagles.

Natural research Ltd – Resident Golden Eagle ranging behaviour before and after construction of a windfarm in Argyll. *Scottish Birds* (2005) 25: 24-40.

Case study: Golden eagle (natural research Ltd)

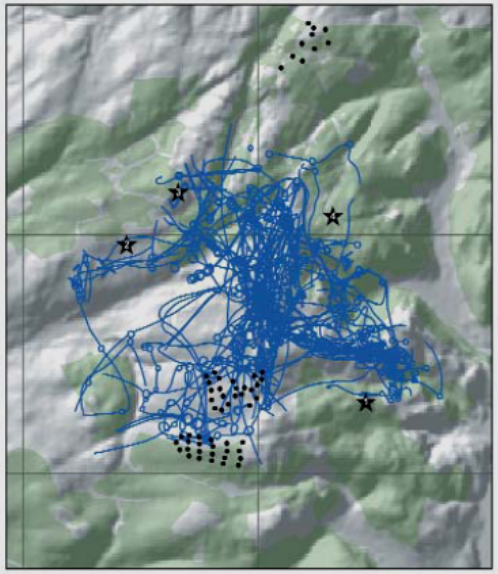


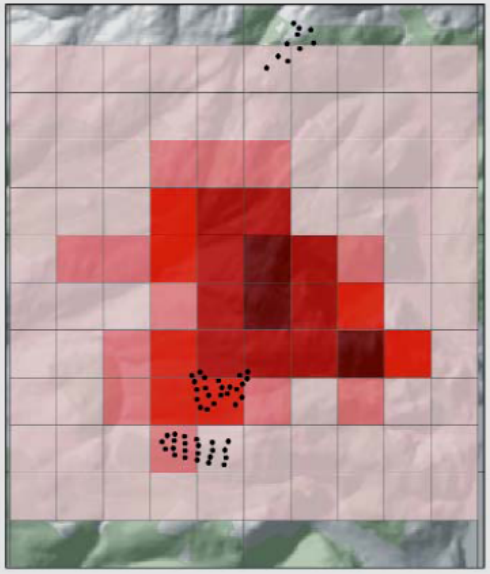
Figure 7a *Flight paths (left), and grid of relative use of km squares (right) by Golden Eagles (male and female) before windfarm construction at Beinn an Tuirc.*

Legend

- Vantage points
- Turbines
- Flight lines
- Forestry

Metres of flight line per km square

- 0 - 5000
- 5001 - 10000
- 10001 - 20000
- 20001 - 40000
- > 40001



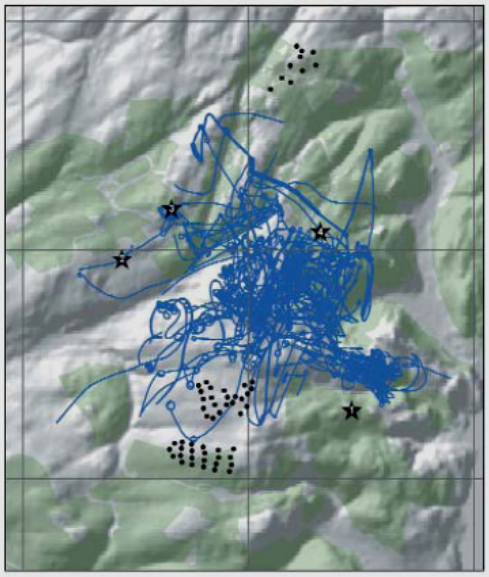


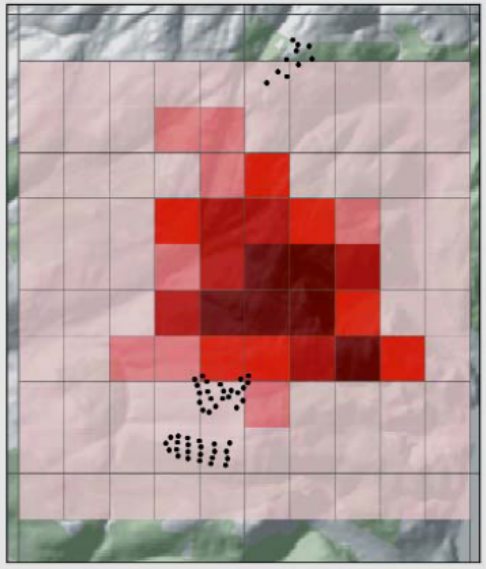
Figure 7b *Flight paths (left), and grid of relative use of km squares (right) by Golden Eagles (male and female) after windfarm construction at Beinn an Tuirc.*

Legend

- Vantage points
- Turbines
- Flight lines
- Forestry

Metres of flight line per km square

- 0 - 5000
- 5001 - 10000
- 10001 - 20000
- 20001 - 40000
- > 40001



Natural research Ltd – Resident Golden Eagle ranging behaviour before and after construction of a windfarm in Argyll. *Scottish Birds* (2005) 25: 24-40.

Case study: Little Tern (Perrow *et al*, 2006)

- Radio telemetry on **LittleTerns *Sterna albifrons*** at the North Denes (SPA).
- 30 turbine offshore wind farm on Scroby Sands.
- Technically difficult tagging & tracking small seabird.
- Comparative data (**2003 & 2004**) prey varied greatly.
- **Striking differences in activity & foraging pattern 03-04.**
- Changed the perception of the scope of foraging terns.

- **Breeding terns ranged < 6.3 km^2** with a range span up to 4.6 km.
- **Non-breeding terns ranged widely up to 52 km^2** & up to 27 km in a single bout.
- Breeding terns ranging 2-3km are within range of the wind farm.
- Only a small proportion of foraging time was spent at beyond 2-3km.
- Value of radio (and satellite) telemetry in illustrating habitat use.
- To determine precautionary distances for wind farms & for collision models.

Case study: Little Tern (Perrow *et al*, 2006)

- **Between year differences**.
- Fluctuation in prey abundance.
- Fluctuation of foraging distance.
- **Importance of longer studies**.
- **Minimum of 2 years study**.
- Radio-tracking provides knowledge of individual behaviour.

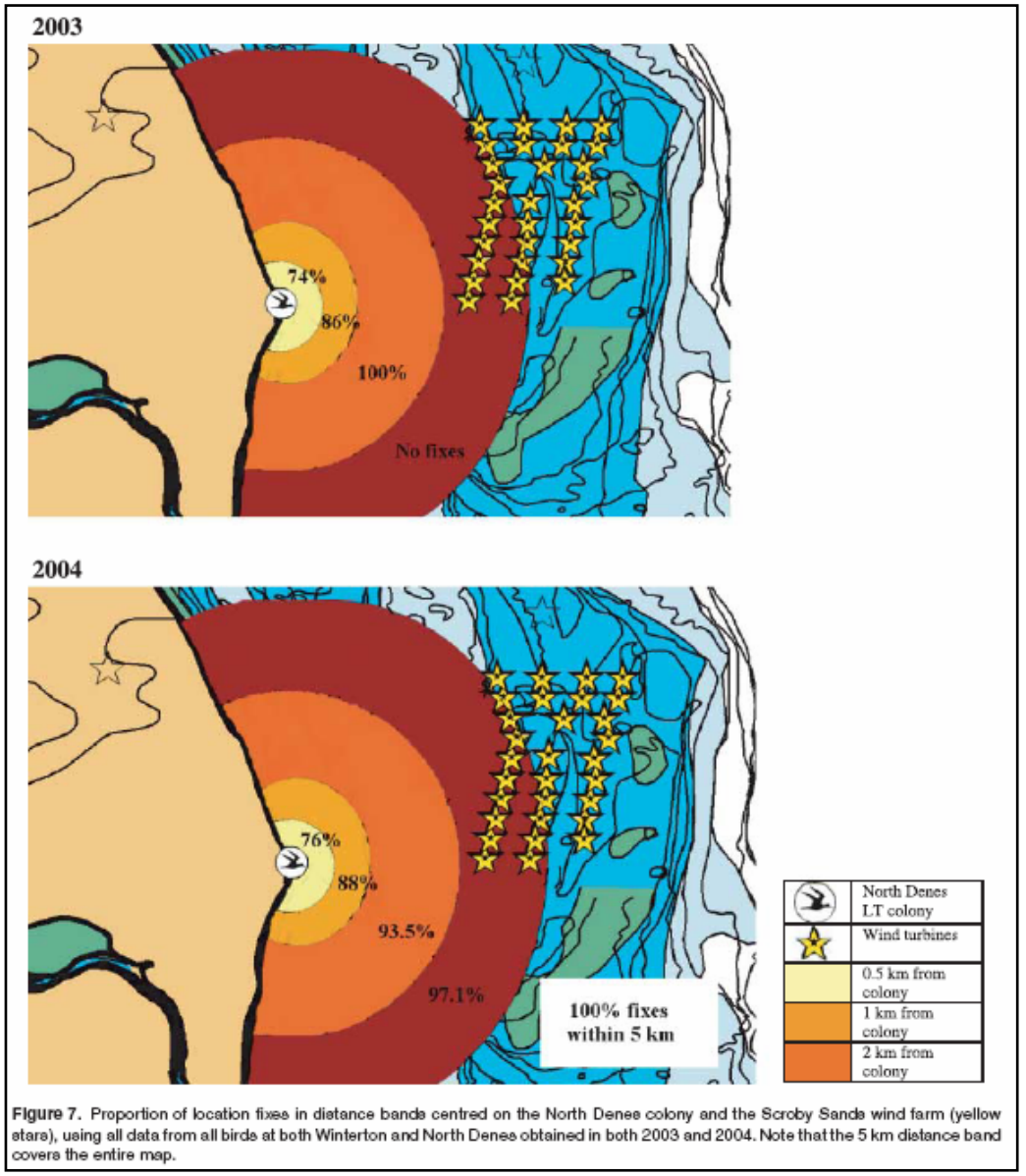


Figure 7. Proportion of location fixes in distance bands centred on the North Denes colony and the Scroby Sands wind farm (yellow stars), using all data from all birds at both Winterton and North Denes obtained in both 2003 and 2004. Note that the 5 km distance band covers the entire map.

ECON Ecological Consultancy & Enviroserve – Radio telemetry as a tool for impact assessment of wind farms: the case of Little Terns Sterna albifrons at Scroby Sands, Norfolk, UK. *Ibis* (2006) 148: 57-75.

Case study: Common Scoter (Kaiser et al, 2005)

- **Individual Based Modelling** for Offshore Wind Farms.
- Predicting **Over Winter Mortality** at a population level for Liverpool Bay.
- Simulation for a combination of existing, consented and proposed wind farms:

- Existing (North Hoyle),
- Consented (Rhyl Flats & Burbo Bank)
- Proposed (Gwynt-y-Mor & Shell Flat) windfarms.

- **Predicting Displacement Effects** for Common Scoter, *Melanitta nigra* for an area of sea with 0 or 2km radius around windfarms.

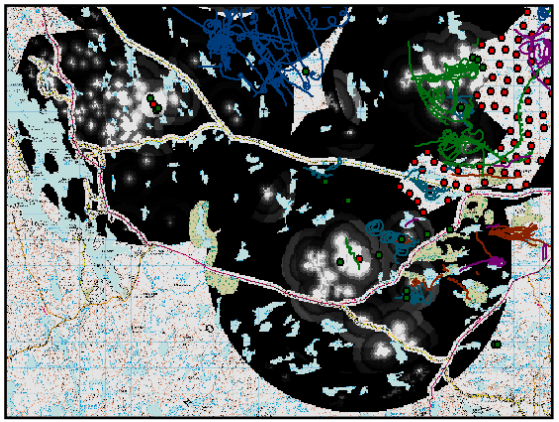
REVIEW ELEMENTS

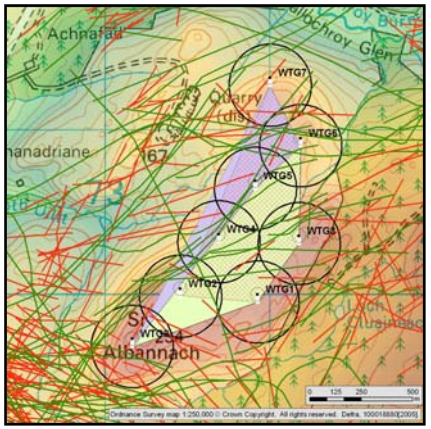
- A description of the **physical habitat utilised by Common Scoter.**
- Quantification of the **spatial and temporal variability in prey.**
- Observation of the **behaviour of birds at sea and their response to disturbance.**
- A review of the diving duck literature
- Development of a **behavioural model to predict responses to windfarms.**
- Calibration and validation of the behavioural model.

The role of modelling

INCREASINGLY COMPLIMENTING FIELD DATA IN UK.

- **Collision Risk Modelling - CRA** **(**SNH, Band *et al*, 2006**).**
- **Predicting Aquila Territory - PAT** **(**McLeod et al, 2002**).**
- **Individual Based Behavioural models** **(**Kaiser *et al*, 2005; & waders**).**
- **Population Viability Analysis.** **(**SNH, CSL, CEH**).**
- **NEED TO RETAIN** **(Realism & Test predictions).**
- **TRY & AVOID FORMULAIC APPROACH** **(Tick box planning applications).**





Lessons learned & knowledge gaps.

FIELD ASSESSMENT

- **SIGNIFICANT UNCERTAINTIES REMAIN. (UK does not have all the answers).**
- **Importance of a MINIUMUM OF 2-3 yrs monitoring (Sampling Variation).**
- **Use of COMPLIMENTARY techniques (Visual, Radar, boat, aerial etc).**
- **Increasing use of RADAR - NOCTURNAL & LOW VISIBILITY INFO.**
- **Sampling WEATHER VARIATION is key.**
- **AVOIDANCE FACTORS for a range of species is essential for modelling.**
- **HIGH ACTIVITY DOES NOT NECESSARILY EQUATE TO HIGH COLLISION MORTALITY (Species & Site-specific).**



Lessons learned in planning.

PLANNING PROCESS

- **LOCATION OF PROPOSED WIND DEVELOPMENTS REMAINS KEY.**
- **EARLY CONSULTATION with statutory & NGO conservation bodies.**
- **Importance of STANDARDISING GUIDANCE.**
- **Importance of CONSISTENT ASSESSMENTS.**
- **Rigorous assessments complying to guidance are shorter in planning.**
- **EIA applications ignoring guidance are heavily scrutinised & slower in planning.**
- **Biological data cannot be gathered at the pace the wind industry would like.**

Lessons learned expertise gained.

INDUSTRY EXPERTISE

- **Guidance information, Expert knowledge & understanding are developing.**
- **Workshops for industry consultants, developers & statutory bodies.**
- **Conservation interests must be balanced with ambitious renewables targets (10% by 2010, 20% by 2020 & 50% by 2050 to tackle Climate Change).**
- **Wind Industry, Government departments, NGOs and Public interest must attempt to balance the competing constraints and concerns during rapid development.**